prior art

PATENT ABSTRACTS OF JAPAN

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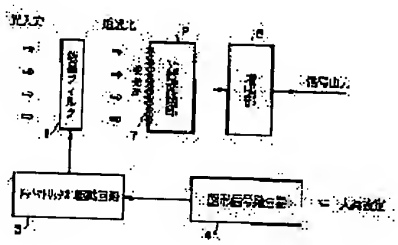
(54) LIQUID CRYSTAL INPUT LIGHT CONTROL FILTER FOR PHOTOELECTRIC CONVERSION DEVICE

(57)Abstract:
PURPOSE: To provide a liquid crystal input light control filter for a photoelectric conversion device capable of changing the intensity of a light beam incident on the light receiving surface of the photoelectric conversion device uniformly or only related to the required area part of the light receiving surface.
CONSTITUTION: An achromatic color dot matrix liquid crystal filter 1 is arranged close to the light receiving surface 7 of the photoelectric conversion part 2, and the liquid crystal filter 1 is driven by a dot matrix driving circuit 3. The density of the liquid crystal filter 1 is increased uniformly or partially, that is, the light transmissivity is reduced according to a figure signal supplied from a figure signal generator 4 by the driving circuit 3. Thus, the intensity of the light beam incident on the light receiving surface 7 is attenuated uniformly over the whole area of the light receiving surface or freely only related to the required part among the whole area.



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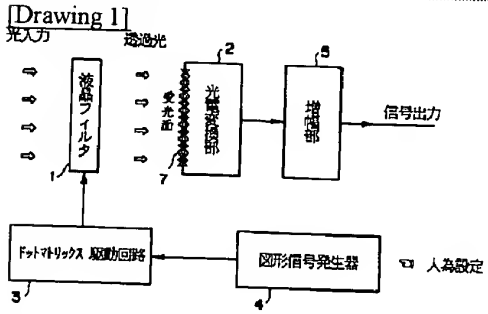
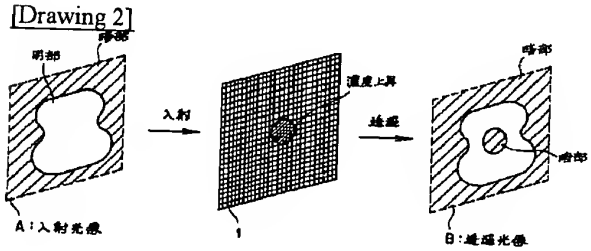
DRAWINGS

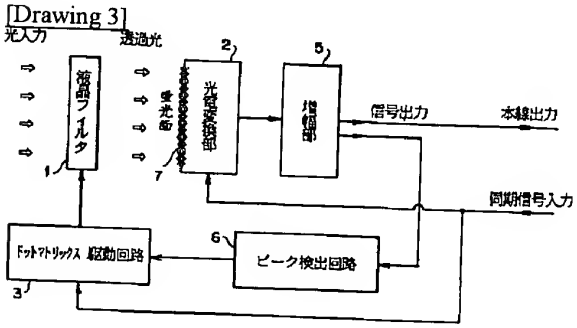
[Drawing 1]



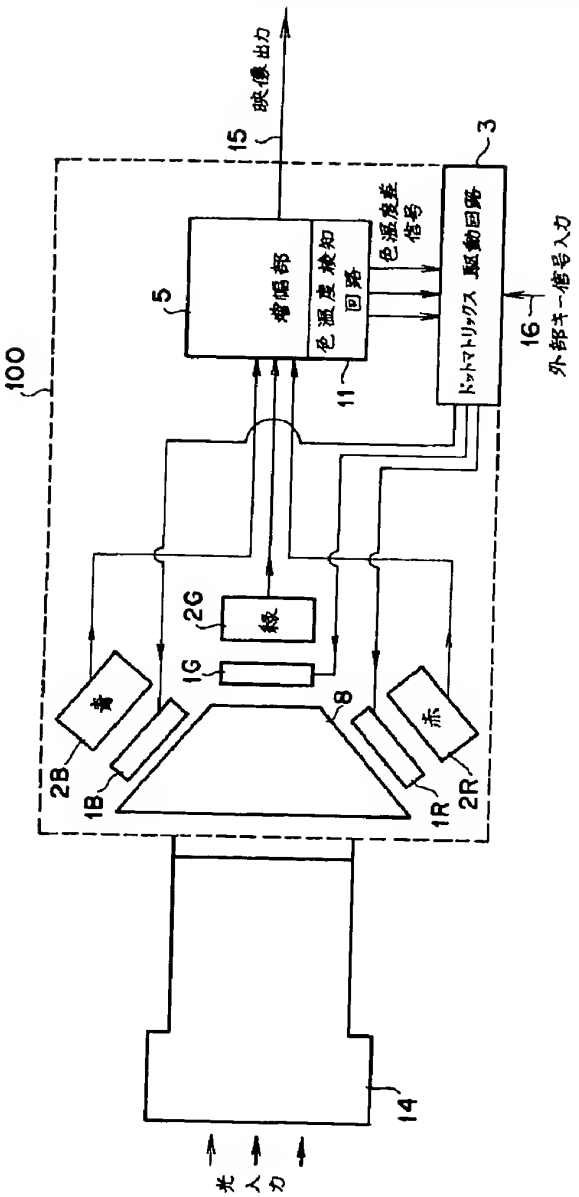
[Drawing 2]



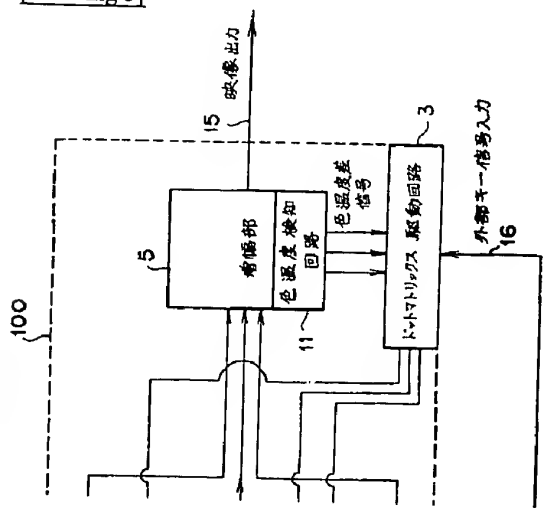
[Drawing 3]



[Drawing 4]


映像出力
15
3
増幅部
色温度検知回路
色温度差信号
5
11
ドットマトリックス 駆動回路
16
外部キー信号入力
100
2G
緑
1G
青
2B
1B
8
赤
1R
2R
14
光入力

[Drawing 5]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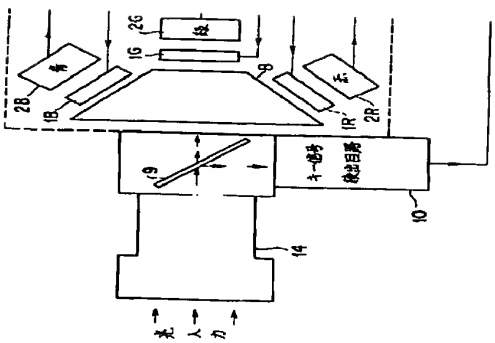

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the basic composition of this invention.
[Drawing 2] It is the conceptual diagram showing an example of change of the image of light which carries out outgoing radiation to the image of the light which carries out incidence in the liquid crystal filter of drawing 1 .
[Drawing 3] It is the block diagram showing the circuitry of the 1st example of this invention of the excessive input light prevention circuit using the high-level component of the signal output of a photoelectrical inverter.
[Drawing 4] It is the block diagram showing the circuitry of the 2nd example of this invention applied to color image pck-up equipment by using this invention as a special effect filter.
[Drawing 5] It is the block diagram showing the circuitry of the 3rd example of this invention which added the automatic key signal-detection circuit to the circuit of drawing 4 .
[Description of Notations]
1, 1R, 1G, 1B Liquid crystal filter
2 Photoelectrical Transducer
2R, 2G, 2B Image pck-up element
3 Dot-Matrix Drive Circuit
4 Figure Signal Generating Circuit
5 Amplifier
6 Peak-Detection Circuit
7 Light-receiving Side
8 Color-Separation Prism
9 One-way Mirror
10 Key Signal-Detection Circuit
11 Color Temperature Detector
14 Lens
15 Image Output
16 External Key Signal Input

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the liquid crystal formula input light control filter for photoelectrical inverters to which the luminous intensity which carries out incidence to the light-receiving side of a photoelectrical inverter using a liquid crystal device can be changed uniformly or partially.
[0002]
[Description of the Prior Art] Conventionally, in the television camera etc., a trimming filter, conversion filter for color temperature, etc. which adjust uniformly the light which carries out incidence to the light-receiving side of a photoelectrical inverter covering the whole light-receiving side are known.
[0003] On the other hand, what applied the liquid crystal device as an optical drawing machine is proposed. Furthermore, it considers as the example to which the liquid crystal device was applied as a dimmer, and there are an aperture panel, a screen, etc. which operate as electronic-formula curtains which can control transparency by voltage. The example using this aperture panel and the panel of the same composition as a modulated light means of stage-lighting equipment is also reported.
[0004]
[Problem(s) to be Solved by the Invention] However, in the former, the filter equipment using the possible liquid crystal device of carrying out the automatic regulation of color temperature, the brightness, etc. according to color temperature change, brightness change, etc. of an image pck-up picture did not exist.
[0005] Moreover, in the former, the equipment with possible making it change freely only about the area (or directed) portion into which it asks for the intensity of light which carries out incidence to the light-receiving side of a photoelectrical inverter of the whole surface products of a light-receiving side did not exist.
[0006] Then, the purpose of this invention is to offer the liquid crystal formula input light control filter for photoelectrical inverters which made it possible to change uniformly the intensity of light which carries out incidence to the light-receiving side of a photoelectrical inverter only about the area portion of a request of a light-receiving side in view of an above-mentioned point.

[0007]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the 1st gestalt of this invention The liquid crystal filter to which it is arranged at the method of light-receiving presence of the photoelectrical transducer of the photoelectrical inverter for changing an incident-light image into an electric picture signal, and concentration can be changed, The concentration of the aforementioned liquid crystal filter is raised according to the control signal supplied from a signal generation means to generate a control signal, and this signal generation means, and it is characterized by providing the liquid crystal filter driving means which made it possible to attenuate the intensity of light which carries out incidence to the light-receiving side of the aforementioned photoelectrical transducer by this.
[0008] Moreover, including a color temperature detection means by which the aforementioned signal generation means detects the color temperature difference of the aforementioned incident-light image as the one mode in this invention, according to the color temperature difference signal of the aforementioned color temperature detection means, the aforementioned liquid crystal filter driving means can carry out adjustable control of the concentration of the aforementioned liquid crystal filter, and can be characterized by this realizing adjustable formula conversion filter for color temperature.
[0009] Moreover, as a mode of others [this invention], including an optical on-the-strength detection means by which the aforementioned signal generation means detects the strength of the aforementioned incident ray, the aforementioned liquid crystal filter driving means can carry out adjustable control of the concentration of the aforementioned liquid crystal filter, and can be characterized by this realizing an adjustable formula dimming filter according to the detection signal of the aforementioned optical on-the-strength detection means.
[0010] In order to attain the above-mentioned purpose, the 2nd form of this invention The dot-matrix formula liquid crystal filter to which it is arranged at the method of light-receiving presence of the photoelectrical transducer of the photoelectrical inverter for changing an incident-light image into an electric picture signal, and concentration can be changed partially, According to the figure signal supplied from a figure signal generation means to generate a figure signal according to an input-control signal, and this figure signal generation means, the concentration of the aforementioned dot-matrix formula liquid crystal filter is raised partially. It is characterized by providing the liquid crystal filter driving means which made it possible to make it decrease only

about the portion for which the intensity of light which carries out incidence to the aforementioned light-receiving side by this is needed of the whole surface products of this light-receiving side.
[0011] Moreover, as the one mode, the aforementioned figure signal generation means can detect the peak component of the output signal of the aforementioned photoelectrical inverter, and this invention can be characterized by being the peak-detection circuit for excessive incident-light prevention which generates the figure signal corresponding to this detected peak component.
[0012] Moreover, this invention has further the optical member which separates an incident-light image ahead of the aforementioned dot-matrix formula liquid crystal filter as other gestalten. It can be characterized by the aforementioned figure signal generation means being a key signal-detection circuit for the special-effects effects which changes into an electrical signal the aforementioned incident-light image which carries out incidence through this optical member, extracts a high-level component from this electrical signal, and is supplied to the aforementioned liquid crystal filter driving means by making this into a key signal.
[0013]
[Function] With the 1st gestalt of this invention, since a liquid crystal filter is arranged near the light-receiving side of a photoelectrical inverter, the voltage of the liquid crystal filter is changed according to an input signal by driving means and it is made to carry out adjustable control of the light transmittance of a liquid crystal filter, it can be used as adjustable formula conversion filter for color temperature, an adjustable formula dimming (ND) filter, etc.
[0014] With the 2nd gestalt of this invention, attach a dot-matrix formula liquid crystal filter in the light-receiving side of a photoelectrical inverter, and a filter by moreover, the driving means which carry out drive control Since the voltage of the coordinate position range the liquid crystal filter was specified to be is changed and it is made to carry out adjustable control of the light transmittance of the coordinate position range, in the photoelectrical transducer of a photoelectrical inverter, concentration can be arbitrarily changed to the incident-light passage space of the method of light-receiving presence partially. Therefore, the intensity of light which penetrates the liquid crystal filter and carries out incidence to the light-receiving side of a photoelectrical inverter can be attenuated only about the portion for which it asks of the whole surface products of a light-receiving side.
[0015]
[Example] Hereafter, with reference to a drawing, the example of this invention is explained in detail.
[0016] (Basic composition) The basic composition of this invention is first shown in drawing 1 . In drawing 1 1 A colorless dot-matrix formula liquid crystal filter (A liquid crystal filter is called hereafter), the photoelectrical transducer which constitutes the photoelectrical inverter which receives the light in which 2 penetrated the liquid crystal filter, The dot-matrix drive circuit equivalent to the driving means for 3 performing control which raises the concentration (it corresponds to transparency or a light transmittance) of the liquid crystal filter 1 free, 4 is a figure signal generator equivalent to a directions means to direct the grade of the above-mentioned concentration elevation range (coordinate position range) and concentration to the dot-matrix drive circuit 3. Moreover, 5 is an amplifier which amplifies the output of the photoelectrical transducer 2, and a picture signal is acquired from an amplifier 5.
[0017] If it furthermore explains in full detail, the liquid crystal filter 1 will be a liquid crystal board which constitutes the matrix from a liquid crystal dot of a vertical n train and a horizontal m train, and, as for these liquid crystal dot, each concentration will change with control of the dot-matrix drive circuit 3 (a drive circuit is called hereafter) free. As this liquid crystal filter 1, the liquid crystal device which used the dynamic scattering (DS) mode of a pneumatic liquid crystal and cholesteric pneumatic phase transition mode, for example or the liquid crystal device of the type which distributed the pneumatic liquid crystal as a minute spherical form in macromolecule polymer, and a liquid crystal device with still better known TN (twist pneumatic mode) liquid crystal device, GH (guest host mode) liquid crystal device, etc. can be used.
[0018] The drive circuit 3 is a matrix-control circuit which controls the concentration of each dot of the liquid crystal filter 1, and the signal (a figure signal is called hereafter) leading to the control is generated by the figure signal generator 4.
[0019] The figure signal generator 4 generates the figure signal which determines into what concentration each dot of the liquid crystal filter 1 is made, i.e., it is what form and is the figure by concentration elevation made to draw in what concentration balance on the liquid crystal filter 1?, and performs a setup of this figure and concentration balance with artificial or the signal from the outside.
[0020] The photoelectrical transducer 2, its light-receiving side 7, and an amplifier 5 constitute the conventional photoelectrical inverter, change into an electrical signal the light which carried out incidence to the light-receiving side 7 by the photoelectrical transducer 2, and amplify and output it by the amplifier 5. Here, you may think that the form and size of the image of the light which carries out incidence in the image and the light-receiving side 7 of the light which has stuck mostly the liquid crystal filter 1 and the light-receiving side 7, and penetrates the liquid crystal filter 1 correspond. In addition, since the liquid crystal filter 1 is colorless, it does not change about the color of the image of the light which carries out incidence, either.
[0021] By raising the concentration of the 1 aspect product of the liquid crystal filter 1 about the image of the light which passes the liquid crystal filter 1 and carries out incidence to the light-receiving side 7 by the above composition as shown in drawing 2 explains per, when making the intensity of light reduced about the 1 aspect product of an image. In drawing 2 , A is an incident-light image to the liquid crystal filter 1, and B is the transmitted light image of the liquid crystal filter 1, i.e., the incident-light image to the light-receiving side 7.
[0022] First, an optical input usually sometimes penetrates the liquid crystal filter 1, and incidence is carried out as it is to the light-receiving side 7. That is, incidence of the image of the light which carried out incidence to the liquid crystal filter 1 is carried

out to the light-receiving side 7 with a form and the intensity of light as it is.
[0023] Next, if the figure signal generator 4 is operated, from the figure signal generator 4, directions will be sent [raising concentration about a part of area of the liquid crystal filter 1 and] to the drive circuit 3. The drive circuit 3 controls the liquid crystal filter 1 according to these directions. Then, the image B of the light which penetrates the liquid crystal filter 1 has the intensity of light reduced about the portion which penetrates the portion into which concentration rose. That is, in response to attenuation of the intensity of light, incidence of the image A of the light which carried out incidence is carried out to the liquid crystal filter 1 to the light-receiving side 7 about the part.
[0024] In the case of the signal with which the output signal of the above-mentioned figure signal generator 4 covers the whole surface product of the liquid crystal filter 1, the light transmittance of the liquid crystal filter 1 changes uniformly.
[0025] (The 1st example) Drawing 3 corresponds to the 2nd gestalt of this invention, and shows the circuit of the 1st example of this invention which constituted the excessive incident-light prevention circuit in image pck-up equipment to the figure signal in drawing 1 using the peak component of an image pck-up equipment signal output. In drawing 3 , the component of 1, 2, 3, 5, and 7 is the same as that of drawing 1 . 6 is a peak-detection circuit, generates a figure signal instead of the figure signal generator 4 according to the position of the peak component which detected and detected the peak component of the output signal of an amplifier 5 etc. to the dot-matrix drive circuit 3, and, thereby, prevents the excessive incident light to the photoelectrical transducer 2.
[0026] First, the image of the light containing the high brightness component (henceforth, peak light) which continued in time carries out incidence to the liquid crystal filter 1, and carries out incidence to the light-receiving side 7, without receiving attenuation at all. Then, from an amplifier 5, the video signal containing the peak component is outputted and it inputs into the peak-detection circuit 6. Furthermore from the peak-detection circuit 6, the signal (a peak signal is called hereafter) of only a peak component is inputted into the drive circuit 3.
[0027] Since the drive circuit 3 operates with a synchronizing signal completely synchronizing with the scan of the photoelectrical transducer 2, it raises concentration by inputting a peak signal here about the liquid crystal dot of the 1 aspect product of the liquid crystal filter 1 which the peak light used as the cause passes. Since this concentration is, are proportional to the level, i.e., the peak intensity of light, of a peak signal, transparency of peak light is restricted to below fixed level, and the image of the light which carries out incidence to the light-receiving side 7 becomes the following [a certain fixed intensity of light], and can prevent an excessive incident light.
[0028] In addition, in this example circuit, since the output of the photoelectrical transducer 2 is used, and, as for the a maximum of 1 field (1/60 second), a liquid crystal filter does not operate in time, i.e., an NTSC television system, until the scan of the photoelectrical transducer 2 takes a round, the excessive incident light to the light-receiving side 7 cannot be prevented. However, the level rise with a rapid speed which usually exceeds 1/60 second since it is producing the excessive incidence of light with release of lens drawing of image pck-up equipment or change (pantilt) of the image pck-up direction is considered that there are very few examples, therefore since the circuit of this example operates at the early time of a level rise transition stage, it can prevent it about the excessive incidence in almost all cases.
[0029] (The 2nd example) The composition of the 2nd example of this invention which drawing 4 corresponds to the 1st form of this invention, used this invention as the special effect filter, and was applied to color image pck-up equipment is shown. light -- an input -- an image pck-up -- a lens -- 14 -- passing -- color separation -- prism -- eight -- R (red) -- G (green) -- B (blue) -- each -- a color -- a component -- decomposing -- having -- respectively -- corresponding -- liquid crystal -- a filter -- one -- R -- one -- G -- one -- B -- a passage -- the image pck-up elements 2R and 2G and 2B -- receiving light -- having . The output signal of the image pck-up elements 2R and 2G and 2B is amplified by the amplifier 5, and serves as the image output 15. 11 is a color temperature detection circuit which supplies a figure signal to the dot-matrix drive circuit 3 instead of the figure generator 4 of drawing 1 , and detects the color temperature difference of the signal inputted into an amplifier 5. The circuit of this example has the function of (1) adjustable formula conversion filter for color temperature and a (2) adjustable formula dimming (ND) filter like the after-mentioned. Hereafter, these functions are explained.
[0030] (1) adjustable formula conversion filter for color temperature -- this is for changing the color temperature of the incident light of color image pck-up equipment into the design value of color image pck-up equipment, and can change the conversion rate arbitrarily according to the color temperature of an incident light Usually, there are some which are performed by attaching conversion filter for color temperature in the case where it is based on level adjustment (white balance adjustment) of each chrominance signal in the electrical circuit after photo electric translation was carried out as a means of color temperature change of color image pck-up equipment, and the front face of a lens. When the degree which especially color temperature changes is large, rough color temperature conversion is made by the latter method, and fine tuning by the back-to-front person's method is performed.
[0031] When an incident light passes conversion filter for color temperature, the principle of the color temperature conversion here in the case of the latter receives attenuation about each color component, respectively, and says that color temperature is changed, after that, with color-separation prism, it is decomposed into each color and incidence of it is carried out to the image pck-up element for each colors. Since it is determined by the coloring at the time of manufacture of a filter, the degree of color conversion of conversion filter for color temperature needs to attach two or more filters at the former, when it is going to change the degree.
[0032] On the other hand, as this example shows to drawing 4 , the respectively colorless dot-matrix formula liquid crystal filter 1 (1R, 1G, 1B) is attached in three the image pck-up elements 2R and 2G and the light-receiving presence sides of 2B a total of

three sheets, and color temperature is adjusted by [which it is decomposed by the color-separation prism 8 and carries out incidence to each image pck-up element 2] being able to dim now for every light and adjusting these dimming balance.
[0033] As for adjustment of dimming balance, i.e., concentration adjustment of each liquid crystal filter 1 for decomposition colors, a color temperature difference signal is sent to the dot-matrix drive circuit 3 from the color temperature detection circuit 11 of an amplifier 5, and this drive circuit 3 adjusts the concentration of each liquid crystal filter 1 according to the color temperature difference signal. Therefore, in this example, since the color temperature conversion according to the color temperature of an incident light is possible, it is not necessary to attach a filter to a lens in piles like before, and there is an advantage that fine tuning of color temperature further performed by the electrical circuit, i.e., white balance adjustment, can be carried out simultaneously.
[0034] (2) an adjustable formula dimming (ND) filter -- this is a thing at the time of using only in order to reduce the strength of an incident light (it dims) and to dim the function of the above (1) Therefore, it is also possible to be able to change the rate of dimming arbitrarily and to operate it with (1) simultaneously like (1). That is, although the liquid crystal filter is used three sheets in this example, if these are operated at the same rate of dimming, the ND filter function of (2) is realizable.
[0035] (The 3rd example) Drawing 5 corresponds to the 2nd gestalt of this invention, and shows the composition of the 3rd example of this invention adds the automatic key signal-detection circuit 10 to the composition of drawing 4 , and it was made to also have a function as a special-effects filter. In addition, 9 of drawing 5 is the one-way mirror 9 which carried out insertion arrangement into the optical path between a lens 4 and the color-separation prism 8, incidence of the transmitted light of a one-way mirror 9 is carried out to the decomposition prism 8, and incidence of the reflected light of a one-way mirror 9 is carried out to the key signal-detection circuit 10.
[0036] Here, a special-effects filter obtains production-special effect on the image output screen of image pck-up equipment using "elevation of the partial concentration of the liquid crystal filter 1." For example, it is said that it is as changing a color **** [, and]. [making dark a screen lower half and a portion called only a person's circumference, or making it bright]
[0037] In addition, usually, although the special effect of such images is performed in many cases (post production processing) by the image processor of exclusive use after photography / record, by this example, it processes the "light" before photo electric translation, and essentially differs from what processes electrically the image output which received each electric processings (a gamma correction, a level limit, frequency band limit, etc.) of image pck-up equipment.
[0038] When the concrete example was given and the person who made the bright big aperture the back, for example is photoed, the scene besides an aperture will be crushed by usual almost white by electric processing (level limit) of image pck-up equipment. Then, the image pck-up of the "light" by this example of "dimming only a portion with a bright aperture except for a person" which included the scene besides an aperture, without being crushed white when performing processing in a stage is possible at the time of photography (the backlight amendment effect). However, since this is already crushed even if it is going to revive the portion by post production processing after photography / record, it is absolutely impossible. Thus, if this example does not carry out processing in the stage of "light", it is effective in unrealizable special effects.
[0039] With this special-effects filter, it is the thing to which concentration elevation of area is carried out in part to operation of (1) in the 2nd example of the above and (2) changing concentration about the whole surface product of the liquid crystal filter 1. The part was already described about the principle of operation of concentration elevation of area.
[0040] Now, in order to specify the portion efficiently, it is effective to add the function to photography equipment itself to take to dim only especially a photographic subject's bright portion, when using this example at the time of photography, and] a photograph. As shown in drawing 5 , the light figure which carried out incidence to the lens 14 carries out incidence of the image of the light of the intensity of light which branched level and branched to the key signal-detection circuit 10 in part with a one-way mirror 9. The image pck-up element is built in the key signal-detection circuit 10, and when the completely same light figure of type as the image pck-up element (the image pck-up elements 2R and 2G of drawing 4 , 2B) of the main part of image pck-up equipment carries out incidence, the same photographic subject picture (image) of type is outputted. The key signal-detection circuit 10 extracts a high-level component (key signal) from this output signal, and sends this key signal 16 to the dot-matrix drive circuit 3. Future operation is the same as the excessive incident-light prevention circuit of drawing 3 , and dims about the portion for which the image of each light which carries out incidence to the image pck-up element (the image pck-up elements 2R and 2G of drawing 4 , 2B) of a main part 100 asks. If concentration balance of the liquid crystal filter 1 of three sheets is made the same in drawing 4 at this time, only the bright portion of the image of light will have the luminosity reduced, and if concentration balance is shifted, a color will change only the portion. That is, a color can be changed. Moreover, only the portion of a certain level instead of the bright portion of a light figure is possible also for extracting only the portion of a certain color in the key signal-detection circuit 10, and only the portion can be processed similarly.
[0041]
[Effect of the Invention] Since the light-receiving side of a photoelectrical inverter can be attenuated about the portion which asks for the intensity of light which carries out incidence among the whole surface products of the light-receiving side according to this invention as explained above, the following effects are acquired, for example.
[0042] (1) By application to an excessive input light prevention circuit like drawing 3 , prevention of the evil of the following in the image pck-up element by excessive input light is attained.
[0043] (i) "Seizure" of "seizure" prevention image pick-up tube of an image pick-up tube is that a light-receiving side causes organization destruction or organization change when excessive input light carries out incidence to a light-receiving side, "the remains of seizure" always remains in the image output of an image pick-up tube, and the quality of the output image of image

pck-up equipment is spoiled. Usually, as the image pick-up tube which produced seizure carries out incidence of the excessive input light all over a light-receiving side and the portion partially burn by performing complete baking is smeared away, employment is continued, or when the worst, you have to exchange for a new article. Therefore, that "seizure" can be prevented by this invention can expect that the economical loss by an employment halt of the image pck-up equipment by "seizure" or the formation of use impossible of an image pick-up tube can be prevented.

[0044] (ii) Although the "smear" of the "smear" prevention solid state image pickup device of a solid state image pickup device is the phenomenon in which the line of white length appears in an output image when excessive input light carries out incidence to a light-receiving side and organization destruction of the image pck-up element is not carried out by this, the quality of an image is spoiled remarkably and generating of a "smear" can be called greatest fault of a solid state image pickup device. On the other hand, since generating of a "smear" can be prevented by this invention, upgrading of the image of image pck-up equipment can be performed. Although improvement of the solid state image pickup device itself is performed for recent-years "smear [in addition,]" prevention, now it is not perfect and this invention which prevents the excessive input light which is the fundamental cause of a "smear" can be called effective thing.

[0045] (2) Since functions, such as a "adjustable formula color temperature filter", a "adjustable formula ND filter", and the "special-effects effect filter", can be used, the improvement of the filter system of image pck-up equipment, realization of special effects (especially backlight amendment), etc. are expectable with the application to drawing 4 and "color image pck-up equipment with a built-in special effect filter" like drawing 5 .

[Translation done.]